What is claimed is:

1. A variable optical-property element, wherein a high degree of brightness is obtained and a polarizing plate is out of use.

2. A variable optical-property element according to claim 1, wherein a variable refractive-index substance causes a refractive index to have a spatially uneven distribution and optical properties of said variable optical-property element are changed by varying a distribution of said refractive index.

3. A variable optical-property element according to claim 2, wherein one of a macromolecular dispersed liquid crystal and a macromolecular stabilized liquid crystal is used as said variable refractive-index substance.

4. A variable optical-property element according to claim 2, wherein a substance in which a refractive index is periodically changed in one direction is used as said variable refractive-index substance.

5. A variable optical-property element according to claim 2, wherein a liquid crystal is used as said variable refractive-index substance and an orientation of molecules of said liquid crystal is controlled by changing a frequency of an electric field or a magnetic field.

6. A variable optical-property element according to claim 1, wherein a macromolecular stabilized liquid crystal is used.

7. A variable optical-property element using a macromolecular stabilized liquid crystal, satisfying at least one of the following conditions:

$$D < \lambda / 5$$

$$D < 2\lambda$$

$$0.5 < ff' < 0.999$$

$$0.1 < ff' < 0.5$$

where D is an average diameter of molecules of said macromolecular stabilized liquid crystal, λ is a wavelength of incident light, and ff' is a ratio in volume between said liquid crystal and said molecules.

8. A variable optical-property element using a macromolecular stabilized liquid crystal as a variable refractive-index substance, wherein a frequency of an electric field or a magnetic field is changed and thereby an orientation of molecules of said macromolecular stabilized liquid crystal is controlled.

9. A variable optical-property element using a liquid crystal in which an anisotropy of refractive index is negative, as a variable refractive-index substance, wherein a frequency of an electric field or a magnetic field is changed and thereby an orientation of molecules of said liquid crystal is controlled.

10. A variable optical-property element using a liquid crystal in which a refractive index is periodically changed in one direction, as a variable refractive-index substance, wherein a frequency of an electric field or a magnetic field is changed and thereby an orientation of molecules of said liquid crystal.

11. A variable optical-property element wherein an orientation of molecules of a variable refractive-index substance in a plane nearly perpendicular to an optical axis is substantially uniform in said plane.

12. A variable optical-property element according to claim 11, wherein a liquid crystal is used as said variable refractive-index substance and an orientation of molecules of said liquid crystal is controlled by changing a frequency of an electric field or a magnetic field.

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13. A variable optical-property element according to claim 11, wherein said refractive refractive-index substance whose molecules are periodically oriented satisfies the following condition:

$$0.5 \text{ nm} < S < \lambda$$

where S is a period of an orientation of said molecules and λ is a wavelength of light.

14. A variable optical-property element using photoresist exposure and etching or lithographic technology in order to make a member for

controlling a direction of an arrangement or an orientation of molecules of a variable refractive-index substance.

15. A variable optical-property element having a variable refractive-index substance provided with a structure such that an electric field or a magnetic field is applied in a direction nearly perpendicular to an optical axis.

16. A variable optical-property element having a variable refractive-index substance, wherein a structure such that an electric field or a magnetic field is applied in a direction nearly parallel to an optical axis and a structure such that said electric field or said magnetic field is applied in a direction nearly perpendicular to said optical axis are provided.

17. A variable optical-property element wherein a temperature of a variable refractive-index substance is changed and thereby optical properties of said variable optical-property element are varied.

18. A variable optical-property element wherein a variable refractive-index substance in which a refractive index is periodically changed in one direction or a variable refractive-index substance with a pseudo-period is used,

19. A variable optical-property element having a variable refractive-index substance, wherein a substance in which a refractive index

is changed at a period P in one direction is used as said variable refractive-index substance and said period P satisfies at least one of the following conditions:

$$P \geqq \lambda$$

$$P \geqq 2\lambda$$

where λ is a wavelength of light.

20. A variable optical-property element having a variable refractive-index substance, wherein a substance in which a refractive index is changed at a period P in one direction is used as said variable refractive-index substance, satisfying at least one of the following conditions:

$$P < \lambda$$

$$|\Gamma / 2\Phi| < 0.11$$

$$|\Gamma / 2\Phi| < 1$$

$$|\Gamma / 2\Phi| < \pi / 6$$

$$|\Gamma / 2\Phi| < \pi$$

$$P < 20\pi \cdot \lambda \fallingdotseq 62.8\lambda$$

$$P < 20\lambda$$

$$\lambda \leqq P < 20\lambda$$

$$\lambda \leqq P \text{ and } |\Gamma / 2\Phi| < \pi$$

$$2\lambda \leqq P < 20\lambda$$

$$2\lambda \leqq P \text{ and } |\Gamma / 2\Phi| < \pi$$

$$(2 / 3)\lambda \leqq P < 20\lambda$$

$$(2 / 3)\lambda \leqq P \text{ and } |\Gamma / 2\Phi| < \pi$$

where λ is a wavelength of light, and Γ and Φ are defined as

$$\Gamma = 2\pi(ne - n_0)d / \lambda$$

$$\Phi = 2\pi d / P$$

where d is a thickness of said variable refractive-index substance, ne is a refractive index of said variable refractive-index relative to extraordinary light, and n_0 is a refractive index of said variable refractive-index relative to ordinary light.

21. A variable optical-property element according to claim 20, wherein a liquid crystal whose molecules are helically oriented at said period P is used as said variable refractive-index substance.

22. A variable optical-property element according to claim 20, wherein a frequency of an electric field or a magnetic field is changed and thereby an orientation of molecules of said variable refractive-index substance is controlled.

23. A variable optical-property element according to claim 21, wherein said liquid crystal has a positive anisotropy of refractive index.

24. A variable optical-property element according to claim 23, wherein a frequency of an electric field or a magnetic field is changed and thereby an orientation of molecules of said liquid crystal is controlled.

25. A variable optical-property element shaped into a concave form,

using a liquid crystal in which an anisotropy of refractive index is negative.

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26. A variable optical-property element according to claim 19, wherein a liquid crystal having a property of selective reflection is used and a wavelength of light used in said liquid crystal is outside a range of wavelengths of light used in said variable refractive-index substance.

27. An optical system comprising:

a front lens unit including a stop and a variable optical-property element placed in the proximity of said stop, and

a rear lens unit including at least one concave surface and one convex surface, placed behind said front lens unit.

28. An optical system comprising:

a front lens unit including a stop and a variable optical-property element shaped into a concave form, placed in the proximity of said stop, and

a rear lens unit including at least one concave surface and one convex surface, placed behind said front lens unit.

29. An optical system according to claim 27, wherein at least one aspherical surface is provided.

30. An optical system according to claim 27, wherein an angle of a

chief ray of light incident on an imaging surface is within a range of 90±20° with respect to said imaging surface.

31. An optical system including at least one variable focal-length lens with negative power and at least one variable focal-length lens with positive power.

32. An optical apparatus having said variable optical-property element or said optical system of the preceding claims.

33. An optical apparatus, wherein characteristics of an electronic circuit or a procedure of image processing is changed in accordance with properties of a variable optical-property element.

34. A variable optical-property element according to claim 20, wherein a liquid crystal having a property of selective reflection is used and a wavelength of light used in said liquid crystal is outside a range of wavelengths of light used in said variable refractive-index substance.

35. An optical system according to claim 28, wherein at least one aspherical surface is provided.

36. A variable optical-property element, wherein a variable refractive-index substance having a structure of a negative anisotropy of refractive index and a period P is used, satisfying at least one of

the following conditions:

$$P < \lambda$$

$$| \Gamma / 2\Phi | << 1$$

$$| \Gamma / 2\Phi | < 1$$

$$| \Gamma / 2\Phi | < \pi / 6$$

$$| \Gamma / 2\Phi | < \pi$$

$$2\mu < d < 300\mu$$

$$P < 60\lambda$$

$$P < 20\lambda$$

$$P < 20\pi \cdot \lambda \fallingdotseq 62.8\lambda$$

$$P < 20\lambda$$

where λ is a wavelength of light, and Γ and Φ are defined as

$$\Gamma = 2\pi(ne - no)d / \lambda$$

$$\Phi = 2\pi d / P$$

where d is a thickness of said variable refractive-index substance, ne is a refractive index of said variable refractive-index relative to extraordinary light, and no is a refractive index of said variable refractive-index relative to ordinary light.

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